dinary mind, and it was impossible to discover in any of the details, by what system they had been coined. There were to be seen columns of polished granite, English marbles, slabs arranged in the manner of the Roman mosaics, and glass columns and rays. These last were hollow, an iron tube, gilt, being passed through them, and had a very splendid appearance. The basin of the font was of glass, and there were glass points on the pinnacles.

The building had a fine outline, as if the architect had made many studies of it, or as if he had viewed it in a fog. The details had been well considered, and nothing had been done, either in whole or in part, without a model. The system of principles and subordinates had been attended to; there was a dome, and subordinate dome; enrichment, and subordinate enrichment; profile, and subordinate profile. This was the principle in the Propylæa, in the scrolls of Raffaelle's frescos, and in the columns of Palladio's town-house at Vicenza. The architect had deeply studied the purpose of the building, and the nature of the materials. He had carefully attended to the principles of co-mensuration, and of "proportion and proportionality." Indeed, he had thrown over the pedants altogether, so that he was ridiculed in his day, though foreign artists applauded, and trade flourished through his exertions.

Thus, Mr. Cockerell said, he had traced the birth and progress of medieval architecture, on which he had thrown some fresh lights, really new to himself, and had shewn how it was possible to produce new combinations. He recommended them to do the same, for it was, in fact, their business to agitate this subject of architecture, to the study of which they should direct all their energies. In concluding his course of lectures, he sought no reward but their gratitude, because, to the words of an author he had often quoted, we lived for others, and not for ourselves.*

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RAILWAYS THROUGH THE SEA.

"Let down your rails, ye nations, near and far;
Yoke your full trains to Steam's triumphal car;
Link town to town; and in these iron bands
Unite the estranged and oft embattled lands."
CHARLES MACKAY.

RESPECTED FRIEND,—The practicability of constructing submarine railways having been pronounced by several scientific individuals, I am induced to crave thy permission to address a few remarks on the subject to the community at large by the medium of thy columns. Being aware that it is only gradually that the human mind can receive any thing greatly foreign to its experience, I presume that I may be excused for attempting to explain that many obstacles which might be supposed to exist against carrying out the plan, may not be of an unsurmountable nature, but such is the power of habit, that although this may be termed the age of inventions, and that in which science guides the car of human affairs, and although man looks with an eye of pity on past ages, he is continually inclined to look with scepticism on things which are proposed to facilitate the development of commerce and civilization, as though science had exhausted her store, and that the time would come when man could no more invent; yet it is probable that the efforts of future ages will prove, that he is now only on the threshold of her temple, and that what man has now in his possession is but as a grain of sand on the sea-shore. Future ages will probably look on the present age as the period when man began to reap the advantages of science, and led the way for infinitely greater results than those which his generation could witness. Science is probably one of the instruments destined to remove many evils which short-sighted man has long considered as inevitable; already she besieges the strongholds of ignorance and superstition. She opens the roads between distant countries by her "handmaid steam,"

"And breaks the barriers that since earth began
Have made mankind a foreigner to man."

But while the rails are laid in almost every country in Europe, while all the important towns of England are connected by these "iron bands," Britain is isolated from the rest of Europe,—twenty miles of sea remain as nature's barrier to universal communication. The traveller from the north reaches Dover, but the train can take him no farther; he retraces his steps, those twenty miles of sea appear to him infinitely more than 100 miles of railway, so that he looks on the continent as a spot which he cannot tread. This may be proved by referring to the small number of persons who cross the channel, compared to the crowds of travellers in the railway trains. May we not then ask the question, can a railway be made from Dover to Calais? Had the question been asked fifty years since, the answer might have been in the shape of a threat to lodge the querist in a lunatic asylum, but in these days of gigantic enterprise the question will appear more plausible, although it will still appear formidable to every one until the subject has been minutely examined.

When an engineer is appointed to examine a country through which a railway must pass, he selects that part which is free from engineering difficulties, that is, he avoids hills and vallies, as far as he can, but when a circuitous track can be avoided, he hesitates not to direct the road to be cut through the highest mountain: now we may examine the nature of the spot between Dover and Calais. If we consult the charts, we shall find that it is a vast level plain, the soil of which though not cultivable, is neither rocky nor mountainous, but there is an obstacle which the engineer has not hitherto surmounted; this plain is covered with water, an element which is too dense for us to feel at home in it; but can it be more difficult to cut a road through the water than through a mountain composed of solid rock? There is a level plain, so that all we have to do is to throw a huge half cylinder of iron on it to prevent the water from obstructing the rails which would be placed under this iron arch; so that to cut the road through the water we have only to pump the water from the tube; when empty, the road would be open, and surely it would be easier to pump water than to cut, and blast, and dig through solid rock, and of course, when completed, the water above could no more interrupt the sub-marine navigation of this road, than the thousand tons of stone on the tunnels of almost every railway on land.

I hope that I have made the plan sufficiently intelligible; now for the details of the work. This immense tube must, of course, be built in separate divisions, perhaps of 1,000 feet in length; in that case only 104 divisions would be required to join the rails of the South Eastern Railway with those of Calais and Paris; now supposing each of these divisions would cost 40,000*l.* the cost of the whole would be 4,160,000*l.*, and if we allow for the expense of throwing them in deep water, of connecting them, of building stations, &c. on a magnificent scale, it will, I believe, be found, that the sum of 8,000,000*l.* sterling would be quite sufficient to complete this sub-marine railway. Perhaps it might be completed at a much less expense, if so, we might even in this age see sub-marine railways constructed in still wider channels; the main things we have to consider is the practicability and economy of the plan. It might be argued that the air would be impure in these buildings, but by means of pipes laid the whole length, and air-pumps worked by steam-engines, the air might be constantly renewed; then by adopting the atmospheric mode of propulsion, the air which would be exhausted from the tube would be almost sufficient to renew the air without other pipes. The building, thus buried in deep water, would be safe from the effects of the storm, and while the sea above would be boiling its waves with fury, the flying train would be rolling with the velocity of the wind, sheltered even more than on land; here wind, frost, or rain could not penetrate, so that the marine passage, instead of being the worse, would be the most agreeable part of the journey. These tunnels would, of course, be lit with gas, and in addition, every carriage might have a lamp on each side, so that each train might be as a moveable hotel.

I suppose that there are very few persons who would not wish to see England joined to the continent by railway; but many more will be inclined to doubt the practicability of the plan: we are so accustomed to question the practicability of any thing with which we are not familiar. The Thames-tunnel was at first considered a desperate undertaking, but at present no one would doubt the possibility of boring under the widest river of England: the immense expense attending the work is the main cause why we do not see the plan generally adopted. But now let us examine whether the construction of sub-marine railways can be more difficult. In boring under the bed of the water, on the latter plan, a considerable depth must be reached previous to excavating under the water; so that engines must be kept constantly at work to pump the water which rushes in torrents in the tunnel; and, in fact, the pumping must be continued until the whole length is boxed, and the arch completely built; but for sub-marine railways the work is almost completed on land, so that the work under water is of a comparatively trivial nature: much less than is required to construct bridges and breakwaters. So at present, I may ask, where does the difficulty lie? Not in building the tunnel, for boiler-makers could complete that part of the work; not in sinking it below—we have only to fill it with water, and it would sink by its weight; not in connecting the divisions—this would be the work of only a few hours. Then where is the obstacle? Perhaps in the fears of the timid, that the building, being surrounded by water, would be in a dangerous position. But would it be considered more safe if surrounded by a fluid as dense as oil or tar, or as heavy as quicksilver? Is water more to be dreaded than any other fluid or substance? Yet we are not afraid of venturing in small vessels, and encountering the most violent storms. It is well known that vessels have been entirely embedded in the waves—the mast only being visible above water; and of course during that time the building is battered by the agitated sea as iron on the anvil—the sailors being tied to the rigging not to be washed overboard. I may ask of those who know something of this "pleasant travelling," which would be the safest position—the vessel floating above, and carried over the mountain waves as with the rapidity of lightning, or the tunnel snugly wedged below, where the water is more dense, and where the effects of the storm could not possibly be felt? Very little consideration may suffice to be enabled to answer the question, particularly with those who have conducted sub-marine operations, and who understand the force with which the sea, when agitated by the wind, will batter against a body within reach of its surface.

But if anything was wanted to prove the safety of a building on the bed of the sea, we might refer to the fact of many vessels having remained on the spot where they had sunk, for half a century or more, without having suffered injury beyond that which resulted by the wearing of the wood, the whole of the timbers having remained as firmly fastened together as when they had sunk below; and yet of course no precaution had been taken to prevent their receiving injury. The Royal George is an illustration of this. After having been so long in deep water, when the divers descended on board, they found a quantity of wine in glass bottles uninjured; many a storm had swept over that building since it had foundered, but they had caused no more injury in it than if it had been embedded in solid rock. Again, then, I ask, what is water, that we should dread to construct a road through it, more than if it was as dense as quicksilver, or as hard as diamond? must we be prevented from laying rails on these vast plains, where the soil belongs to no mortal, merely because they are covered with a fluid too dense for us to breathe, while we penetrate through mountains merely to save a gradient, or to shorten a road a few miles? Surely we need not suppose that obstacles can only be overcome on land, where, to construct railways, valleys must be filled up, hills cut through, viaducts and bridges built across rivers, and frequently large houses must be demolished, and parks utterly destroyed; none of these works and ravages are required for constructing sub-marine railways, the only obstacle is the sea, a body over whose surface we are not afraid of gliding, even in the most terrific storms, in a small building which may be under 20 tons burthen, and to which the bursting of a small plank would be certain destruction; the force of habit seems to lead us, unwillingly perhaps, to feel terror at the idea of finding ourselves in a position where it is not common for us to reside, however free from danger it

* Full reports of Professor Cockerell's lectures are given in this and Nos. 134, 135, 136, 137, and 140 of THE BUILDER.